ATC. The Centralised Storage Facility for the Spanish Spent Nuclear Fuel and High Level Radioactive Waste

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Introduction

Spain has eight power reactors in operation and two power reactors closed down, in different steps of the decommissioning process.

The Industry Commission of the Spanish Parliament unanimously recommended to the Government, in 2004, the development of a centralised storage facility for the Spanish nuclear spent fuel (NSF) and high-level radioactive waste. Eventually, the Government, as responsible for radioactive waste management policy definition, stated in the 6th Radioactive Waste General Plan[1] of 2006 that the construction of the Centralised Storage Facility (ATC in the Spanish acronym) was a priority.

In 2006 an Inter-ministerial Commission presided over by the Secretary of State of Energy was set to define the criteria and supervise the site selection process on a transparent, democratic and participative basis. In the same year an information campaign directed to all the municipalities in the country was carried out. This campaign included publicity in all the newspapers, publication of information in the webpage of the Commission, answering the questions from the municipal councils and general public, etc.

The Spanish Secretary of State of Energy launched in December 2009[2] a public call for candidate municipalities to host the Centralised Interim Storage Facility for nuclear spent fuel and high level radioactive waste.

This planned facility has been designed to receive and store for decades all the spent fuel from the Spanish power reactors (i.e. some 6,700 tonnes of heavy metal) and the high level vitrified waste and long-lived intermediate level waste generated in the reprocessing of Spanish fuel abroad. It will also receive intermediate level radioactive waste from nuclear power plants decommissioning (those with activity levels higher than El Cabril LILW disposal facility acceptance criteria). This period is judged sufficient to allow for technical and social development that would make possible the definition of strategies for a longer-term management options.

ENRESA is the Spanish Organisation responsible for radioactive waste and nuclear spent fuel management and for decommissioning nuclear installations. It is supporting the Commission with the required technical studies and providing information to the different stakeholders. It is also responsible for the design, construction and operation of such facility and, thus, the implementer of the described policy. Moreover, ENRESA performs studies on the long-term solutions and management options to assist the Government in decision-making.

The Technological Park and the Centralised Storage Facility

The project consists of three main elements (figure 1):

- The Storage Facility itself,
- a Technological research centre and
- A business park.

Figure 1. ATC Technological Park. SNF & HLW Centralised Storage Facility

This threefold approach will assist local and regional development, encouraging business implementation in the area on the one hand, and will also give an opportunity to enhance country research in the nuclear spent fuel and high-level waste behaviour fields, to support further management steps, on the other hand.

The total surface of the park will be of around 30 hectares.

<u>The centralised storage facility</u>

The facility has been designed to meet the technical criteria of 10CFR72[3], with envelope site characteristics. Specifically it has been designed to:

- Maintain sub-criticality
- Maintain confinement of radioactive material
- Ensure radiation rates and doses for workers and public do not exceed acceptable levels and remain ALARA.
- Maintain Retrievability
- Provide for heat removal as necessary to meet the above mentioned safety functions

Sub-criticality criteria are meet through the geometry arrangement in the canisters; Confinement criteria through a double confinement system. The NSF itself is not considered as a confinement barrier, the two barriers being the canister and the storage well. The radiation criteria are met through 1.8 m thick walls. Natural draft of fresh air

provides cooling to maintain temperatures below acceptable levels. The structural design and siting criteria provide protection against natural or man induced risks.

The storage facility (figure 2) main parts are:

- Reception area:
- Process area for inspection of packages and encapsulation of NSF.
- Storage Vaults
- Storage module for intermediate level waste
- Auxiliary systems building

Figure 2. Conceptual design of ATC storage vaults

The technology selected for SNF and HLW storage is dry storage in canisters, placed in drywells in storage vaults, whose cross section and general layout can be seen in figures 3 and 4 below.

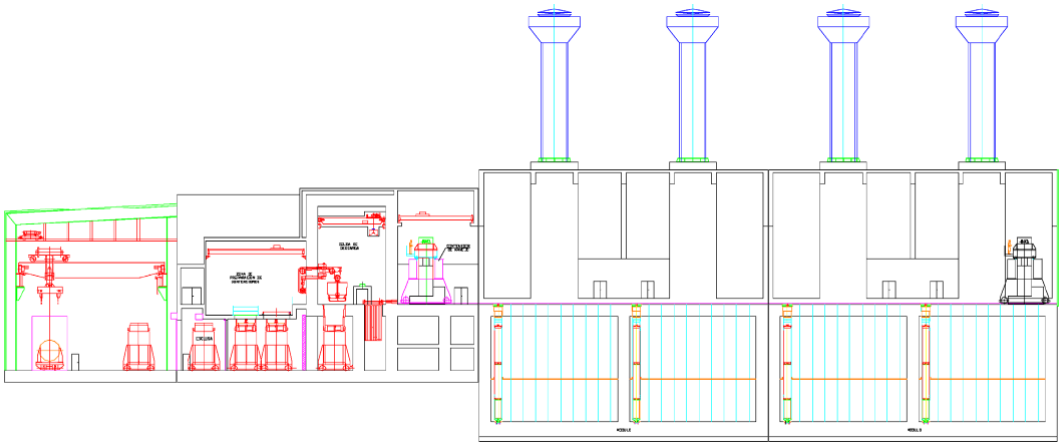

Figure 3. Cross section of ATC facility main buildings

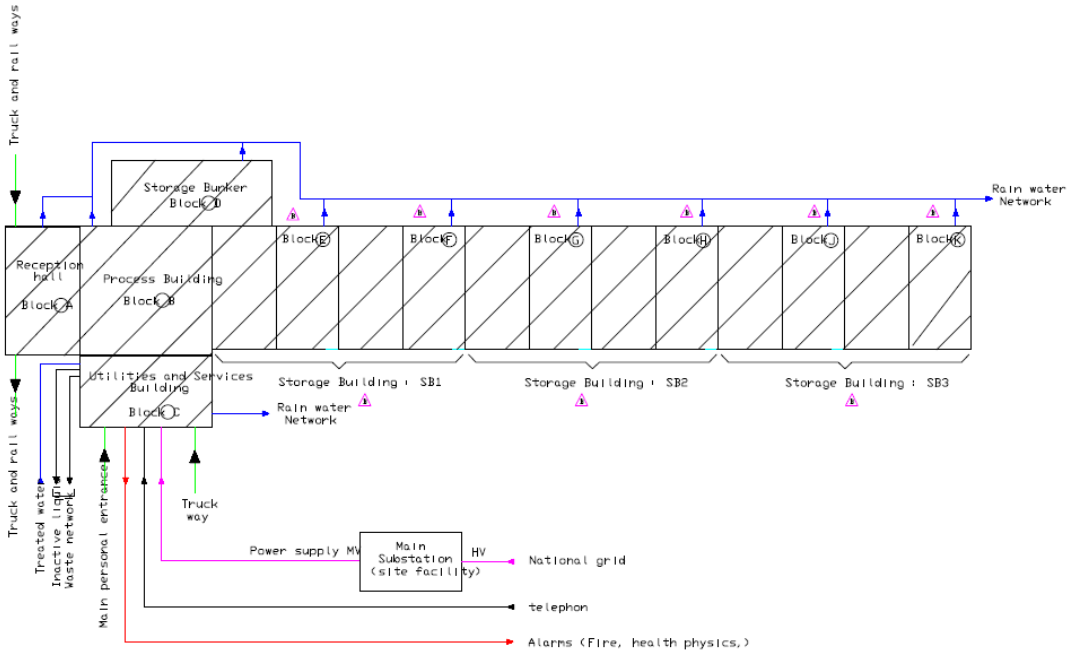

Figure 4 General Layout of ATC facility

In 2004, ENRESA presented a generic design of ATC facility and its safety analysis report to the Safety Authority, Consejo de Seguridad Nuclear-CSN, who assessed favourable[4] this generic design in June 2006.

The reception area is designed to receive transport vehicles by road or train, and for moving to vertical the transport casks and transferring them to the process area.

The process area is designed for opening the transport casks; connect them to the unloading cells and unloading the fuel assemblies or radioactive waste packages inside the two manipulation cells. One of the unloading places is intended for encapsulated waste, not requiring transfer to a canister, the second line is intended for spent fuel needing its placement inside a canister. Once filled up a canister with spent fuel, the lid is automatically welded, and vacuum is raised and the canister backfilled with helium, before final sealing.

The canisters are then moved to the storage vaults. The canister with spent fuel or vitrified waste is placed inside the drywell, which is backfilled with nitrogen to have an inert environment around the canister, allowing for helium potential leak detection from the canisters. Two spent fuel canisters or seven vitrified waste canisters may be stack inside each drywell.

Drywells wall is double, providing a cooling air circulation path for residual heat extraction by natural draft provided by 46 metre-high stacks.

There will be twelve storage vaults, one of whom will provide redundant storage capacity in case of necessity, given the long storage periods considered. Every four vaults form a storage building. Thus the will be three storage buildings that will be constructed sequentially according to the operational needs.

The facility is completed with a storage module or bunker providing room for medium activity waste coming from the reprocessing of Vandellos I Nuclear Power Plant Fuel. There is some internal debate about the need of an additional storage building or the convenience to enlarge this storage module to accommodate larger amounts of intermediate activity waste (or low-level GTCC) from reactor decommissioning and to provide buffer storage for spent fuel casks, especially for those previously encapsulated in double-sealed canisters.

The technological centre associated to ATC

As a complement to the Centralised Storage Facility, a technological centre is planned; whose main laboratory will be a research laboratory for spent fuel and high-level waste. It will have two nuclear laboratories, the spent fuel laboratory already mentioned, and a low level waste laboratory. Their previous basic design is under revision for their integration in the centralised storage facility, to make easier radioactive material transfer and to build and license a single nuclear facility.

Other laboratories foreseen in the technological centre are: materials behaviour laboratory, chemistry and environment laboratory, robotics and industrial pilot plants laboratory.

The business park

As a synergetic effect to support ATC facility needs and as a means for encouraging regional development, the project includes an industrial park. This park would have a general offices building providing services to new companies implementation a number of industrial buildings

Site selection

As mentioned in the introduction, the site selection is based on a volunteering procedure launched in December 2009. A number of Local authorities, after approval by their Municipal Council, offered themselves to host the ATC facility. The second step of the process was the analysis of the application of exclusion criteria defined in the call for candidatures. These criteria were, mainly, of the environmental and cultural heritage protection type. As a conclusion of the analysis of each municipal territory, a preliminary definition of areas non suitable for the proposal of land for siting the ATC facility was prepared. These excluded area definition was communicated to the candidate municipalities, other stakeholders and the general public, and a public allegations period started. Next step is the final definition of excluded areas, and the proposal by the candidate municipalities of land for siting the facility.

Meanwhile, regional and local site characteristics are being collected to support the preliminary studies that will support the Inter-ministerial Commission report proposing a site to the Government.

Licensing

Eventually, characterisation of the selected site will start very soon after the site selection to support the adaptation of the generic design to the specific site and the licensing documents preparation.

A Nuclear Installation of this type will require[5] two main licensing steps:

- A construction authorisation (and a site authorisation that can be granted together with the construction authorisation), to be granted by the Ministry of Industry, Tourism an Commerce (MITC), after binding report from the CSN and after Environmental Impact Statement by the Ministry of the Environment.
- An operations authorisation, to be granted by the MITC, after binding report from CSN.

In addition local authority urban permits are needed for the nuclear installation and for the conventional buildings of the technological centre and business park as well.

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[1] Sexto Plan General de Residuos radiactivos. Ministerio de Industra Turismo y Comercio. Junio 2006
[2] Resolución de 23 de diciembre de 2009, de la Secretaría de Estado de Energía, por la que se efectúa la convocatoria pública para la selección de los municipios candidatos a albergar el emplazamiento del Almacén Temporal Centralizado de combustible nuclear gastado y residuos radiactivos de alta actividad (ATC) y su centro tecnológico asociado. BOE 29 de diciembre de 2009
[3] USNRC 10CFR PART 72—licensing requirements for the independent storage of spent nuclear fuel, high-level radioactive waste, and reactor-related greater than class c waste
[4] Acuerdo del Consejo de Seguridad Nuclear de 28 de junio de 2006, sobre apreciación favorable del diseño genérico de una instalación de almacenamiento temporal centralizado de combustible gastado y residuos de alta y media actividad
[5] REAL DECRETO 1836/1999, de 3 de diciembre por el que se aprueba el Reglamento sobre Instalaciones Nucleares y Radiactivas, modificado por el Real Decreto 35/2008.